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Forensic Technique for Detection of Image Forgery

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Abstract— *Todays digital image plays an important role in all areas such as baking, communication, business etc. Due to the availability of manipulation software it is very easy to manipulate the original image. The contents in an original image can be copy-paste to hide some information or to create tampering. The new area introduces to detect the forgery is an image forensic. In this paper proposes the new image forensic technique to detect the presence of forgery in the compressed images and in other format images. The proposed method is based on the no subsampled contoured transform (NSCT). The proposed method is made up of three parts as preprocessing, nsct transform and forgery detection. The proposed forensic method is flexible, multiscale, multidirectional, and image decomposition is shift invariant that can be efficiently implemented via the à trous algorithm. The proposed a design framework based on the mapping approach. This method allows for a fast implementation based on a lifting or ladder structure. The proposed method ensures that the frame elements are regular, symmetric, and the frame is close to a tight one. The NSCT compares with and dct method in this paper.*

Keywords— Digital Image forensics, multidimensional filter banks, no subsampled countourlet transform, image forgery, filter bank.

I. INTRODUCTION

Digital images are widely used communication medium and play very important role in today's technical world. Images acts as photographic evidence. Due to the speedy advancement in image editing software's make extremely simple to alter the content of digital images. Authenticating a given digital image content has become more difficult because of the possible diverse origins and the alterations that could have been operated on images. When the digital content of an images is used to support legal evidences its important details could be maliciously hidden or erased or duplicated or tampered from the recorded scene, and the true original source can be concealed. A common, easy manipulation is to remove objects from an image or simply remove undesired event from an image. When done carefully, such a digital tampering is difficult to detect. The image forensic is a new research area developed assessing the credibility of an images using different forensic techniques. There are many forensic techniques are available for revealing the presence of forgeries in digital images through geometrical and statistical features ,jpeg quantization artifacts and camera based artifacts. Basically two types of image forgery detection techniques- one is active and other is passive. The two main active techniques are Digital Watermarking and Signature. In case of Watermarking technique it inserting of digital watermark at the source image and then verifying at the receiver end. In case of Digital signature is encoded at the sender side and decoded at receiver end to ensure its integrity. Both the active techniques are intrusive in nature and reduce the quality of image. Passive techniques verify authenticity of images without using pre extracted information. Passive techniques are defined as passive techniques because it does not need any prior information about the image .These passive methods are also called blind methods. So these passive techniques use to perform the image forgery detection task. Various artifacts are introduced by different blind methods that are categorized as Noise Inconsistency, blur, Sharpening, lightening, projective geometry and JPEG compression properties. These artifacts are used to detect whether images are forged or not. In this paper propose forensic technique which is used to detect image forgery. This proposed method divided into three parts:

1. Image preprocessing
2. NSCT transform
3. Forgery detection

The proposed method is compare with an existing Discrete cosine transformation (DCT). DCT used in jpeg as jpeg is a lossy compression image format. Most of the image forensic techniques which are based on the jpeg compression uses DCT [4] transformation which is very poor in accuracy and correction of a result.

The outline of article contains introduction regarding forensic, brief information about previous work in the area

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of forgery detection in section II .Detail about methodology of used for practical forgery detection in section III, experimental results and observations under section IV, while section V gives conclusions for this concept.

II. RELATED WORK

Arthur L. da Cunha, Jianping Zhou and Minh N. Do proposed the nonsubsampled countourlet transformation theory and design, application. The NSCT used in image denoising, enhancement application. NSCT compare with the countourlet transformation and shows that NSCT is multidirectional, multiresolutional and shift invariant as CT and other existing methods are not like that. But NSCT is not used in image forgey detection field [1].

Jianping Zhou, Arthur L. Cunha, and Minh N. Do proposed the non subsampled countourlet transform in the image enhancement. In this paper it gives the short details of an NSCT. It gives algorithm for an image enhancement based on NSCT transform [2].

Hany Farid gives a survey on image forensic techniques. These techniques are pixel based techniques, format based techniques, camera based techniques, physically based techniques, geometric based techniques. Pixel based techniques are cloning ,splicing, resampling, statistical are explain in short. Format based techniques jpeg quantization, double jpeg, jpeg blocking are give in short details. Camera based techniques are color filter array, chromatic aberration, camera response are in short details. Physically based techniques are light direction 2D, light direction 3D, light environment are explain. Geometric based techniques are principal pont, metric measurement are explain in short. [3]

Shi-Lin Wang, Alan Wee-Chung Liew, Sheng-Hong Li, Yu-Jin Zhang and Jian-Hua Li proposed the phenomenon of shifted double jpeg compression effect. When the tampered region is small the SDJPEG detection methods do not provide satisfactory results. In this paper propose a new SDJPEG detection method based on an adaptive discrete cosine transform (DCT) coefficient model. In this proposes the DCT coefficient distributions for SDJPEG and non-SDJPEG patches analysis. An adaptive DCT model for an SDJPEG is compare with another existing methods which give better result for a small size forged object.[4]

Z. Lin, J. He, X. Tang, and C.-K. Tang proposed image tampering detection based on DCT coefficient analyasis. This paper examines the double quantization effect which is hidden in DCT transform. But this proposed method works only on jpeg images not on other images. [5]

Y.-L. Chen and C.-T. Hsu proposed the technique for detection of tampering in a recompressed jpeg images. It requires all the source data in jpeg format.

It works on the mathematical and theoretical formulation of periodicity of compression artifacts. It Only detects the aligned and misaligned recompression images. [6]

Kurakula Sravya, Dr. P. Govardhan, Naresh Goud M praposed Image Fusion on multifocused images based on Non-Subsampled Contourlet Transform. In this paper the NSCT is compare with an wavelet and curvelet transform for an multifocused images. [7]

Yahui Liu, Yao Zhao, Rongrong Ni proposes forensics of Image blurring and sharpening history based on NSCT domain. This article gives a detection algorithm which detect only manipulated image of blur and sharpen operations. [8]

Mandeep kaur, Jyoti and Prakriti proposes the image tamper detection based on JPEG artifacts. The paper presents various artifacts that are introduced during the cut and paste operation when multiple JPEG compression is performed within a specified region of a digital image. This gives short survey on the jpeg artifacts. [9]

T. Bianchi, A. Piva proposed the analysis, detection and localization of an tamperd images but works on only those images which is having nonaligned double jpeg compression. [10][11]

III. METHODOLOGY

They are various image authentication technique to detect the image forgery. These techniques are shown in Fig 1. The proposed method work under the category passive technique. The proposed work divided into three parts as shown in Fig 2.

1. Preprocessing

This preprocessing converts the image into gray scale format. Grayscale image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest.

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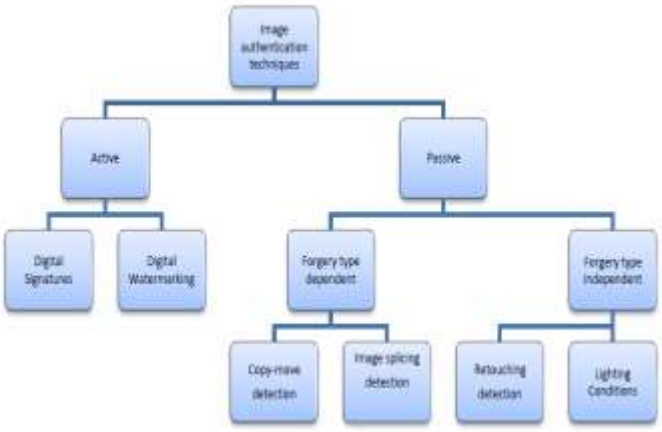

Fig 1: Image Authentication Technique

2. NSCT transform

Nsct is divided into two parts as nonsubsampled pyramid and nonsubsampled Directional Filter Bank (DFB).

2.1. Nonsubsampled Pyramids

The nonsubsampled pyramid is completely different but its evolved from the contourlet transform, the Laplacian pyramid. The nonsubsampled pyramid is a two-channel nonsubsampled filter bank as shown in Fig. 2(a). A nonsubsampled filter bank has no downsampling or upsampling, and hence it is shift-invariant. The perfect reconstruction condition is given as

$H0(z)G0(z) + H1(z)G1(z) = 1.$

This condition is much easier and allows better filters to be designed and also satisfy than the perfect reconstruction condition for critically sampled filter banks. The frequency response is shown in following fig 2.

2.2 Nonsubsampled DFB

The shift-invariant version of the contourlet transform is nonsubsampled DFB. The DFB is also a two-channel nonsubsampled filter bank The ideal Frequency response for a nonsubsampled DFB is different, as shown in Fig. 2(b).

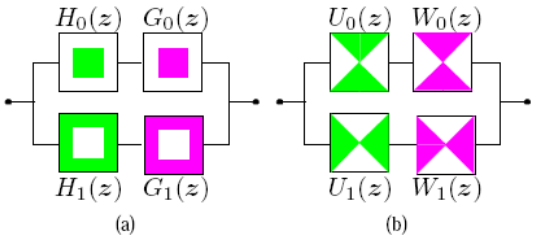

Fig.2: *Ideal frequency response of the building block of:(a) nonsubsampled pyramid; (b) nonsubsampled* DFB [3]

The nonsubsampled contourlet transform combines nonsubsampled pyramids and nonsubsampled DFB's as shown in Fig.3. The multiscale decomposition is provided by Nonsubsampled pyramids and directional decomposition provided by nonsubsampled DFB's. As shown in Fig 3 (a) nonsubsampled pyramid split the input into a lowpass subband and a highpass subband. Then a nonsubsampled DFB decomposes the highpass subband into several directional subbands. The scheme is iterated repeatedly on the lowpass subband. The resulting frequency division is shown in Fig 3(b), the number of directions is increased with frequency.

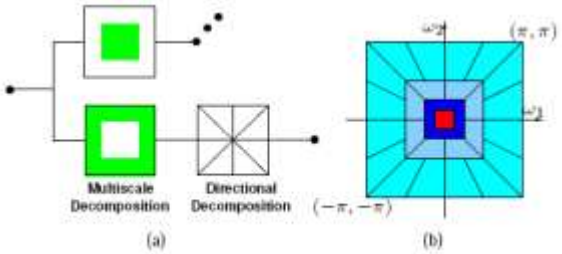

Fig. 3: The nonsubsampled contourlet transform [3]

3. Forgery detection

In forgery detection step it detects the forged object. Consider that one objet is copied and paste into the original image.In this that paste object is an forged object. In proposed method it calculates the absolute subband difference between low frequency components and high frequency components. Based on that difference it detect the forged object easily. Morphological technique makes the bounding box to the forged object.The final output is obtain in this step as shown in Fig 4

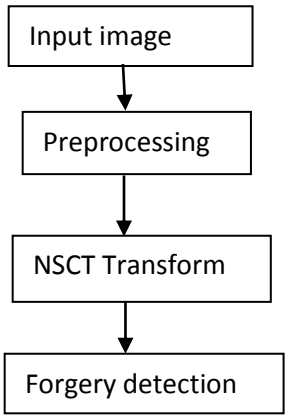

Fig 4: Proposed method

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IV. EXPERIMENTAL RESULTS

The implementation has been tested on MATLAB-R2013a with system having Intel Core i3 4005U CPU Processor 1.70GHz, 4GB DDR3 RAM, Windows 7.

Fig 5: (a) Original image (b) manipulated image (c) low frequency component (d)high frequency component (e)detected forged object with nsct. (f) detected forged object with dct.

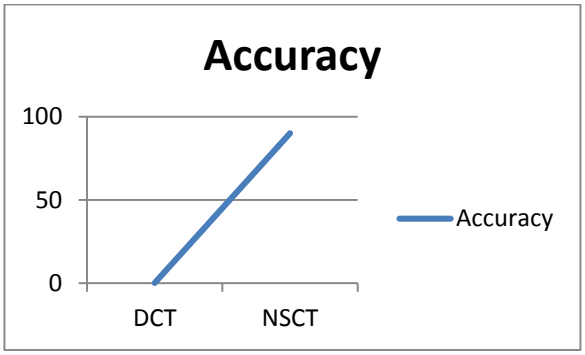

Fig.6: Accuracy graph of NSCT and DCT

The proposed method gives the correct forgery detection of an object compare with DCT. The existing dct method gives red dot forgery detection without accuracy. The low frequency and high frequency image is shown in Fig 5 it is computed using NSCT transform.

V. CONCLUSION

In this paper the new forensic technique is proposed. This forensic technique is used in the detection of image forgery. This technique is based on the Non subsampled countourlet transformation. This proposed method gives maximum accuracy than the previous existing method. Proposed method is multidirectional, shift invariant, multiresolution. This paper gives comparison of NSCT with DCT.NSCT gives better accuracy than the DCT.

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